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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/869,277	06/26/2001	Kiichi Hama	07553.0023	2374

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EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 11/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/869,277

Applicant(s)

HAMA ET AL.

Examiner

Lynette T. Umez-Eronini

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 13-16 and 20-22 is/are allowed.
- 6) ☒ Claim(s) 1,2,6-8,12,17 and 18 is/are rejected.
- 7) ☒ Claim(s) 3-5,9-11 and 19 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6-2001. 6) ☐ Other: ____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2, and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Babu et al. (US 5,053,104).

Babu teaches, "The plasma etching process of the present invention is conveniently conducted in a parallel plate reactor of the type conventionally used for plasma etching of semi-conductor materials" (column 3, lines 17-20), "... and SiO₂ may all serve as the substrate" (column 3, lines 6-12). "In practicing one embodiment of the plasma etching process of the present invention, the specimen of the substrate material to be etched is mounted on one of the grounded electrodes of the reactor or in between a pair electrodes. The gas containing the organohalide (same as applicant's fluorocarbon, process-gas) compound with or without oxygen is introduced into the reactor and a high frequency (RF) power is applied between the power and ground electrodes to produce a plasma between them" (column 3, lines 26-34). "In practicing another embodiment of this invention, the reactor is operated under non-steady state conditions. Such operation may be accomplished by repeatedly varying the etchant gas competition between organohalide-containing (same as applicant's fluorocarbon, process-gas) and non-organohalide-containing (same as applicant's oxygen) by

alternating pulses of the etchant gas compositions" (column 3, lines 50-56). The aforementioned reads on,

A plasma processing method for implementing a plasma process on a silicon oxide film layer formed at a workpiece placed inside a process chamber by generating plasma from a process gas containing, at least, fluorocarbon introduced into said process chamber, wherein; oxygen is intermittently added into the process gas, **in claim 1.**

Babu teaches, "The substrate material is exposed to this organohalide containing plasma for about 0.5 to about minutes or until the etch rate has stabilized to its steady state valued, ... "Thereafter the gas atmosphere in the reactor is changed to essentially 100% by volume oxygen ..." (column 3, lines 34-43), which reads on,

wherein the oxygen is added after the plasma has stabilized, **in claim 6.**

Babu also teaches, "The substrate material is exposed to this organohalide containing plasma for about 0.5 to about minutes or until the etch rate has stabilized to its steady state valued, ..." column 3, lines 34-39). "The pulse time for the essentially pure oxygen gas is usually on the order of about 5 to about 75 seconds ..." (column 4, lines 48—51), which reads on,

wherein the oxygen is cyclically added into the process gas (see above, column 3, lines 50-56), **in claim 2.**

3. Claims 7, 8, and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Babu et al. (US 5,053,104).

Babu teaches, "The plasma etching process of the present invention is conveniently conducted in a parallel plate reactor of the type conventionally used for plasma etching of semi-conductor materials" (column 3, lines 17-20), "... and SiO₂ may all serve as the substrate" (column 3, lines 6-12). "In practicing one embodiment of the plasma etching process of the present invention, the specimen of the substrate material to be etched is mounted on one of the grounded electrodes of the reactor or in between a pair electrodes. The gas containing the organohalide (same as applicant's fluorocarbon, process-gas) compound with or without oxygen is introduced into the reactor and a high frequency (RF) power is applied between the power and ground electrodes to produce a plasma between them" (column 3, lines 26-34). "In practicing another embodiment of this invention, the reactor is operated under non-steady state conditions. Such operation may be accomplished by repeatedly varying the etchant gas competition between organohalide-containing (same as applicant's fluorocarbon, process-gas) and non-organohalide-containing (same as applicant's oxygen) by alternating pulses of the etchant gas compositions" (column 3, lines 50-56). The aforementioned reads on,

A plasma processing method for implementing a plasma process on a silicon oxide film layer formed at a workpiece placed inside a process chamber by generating plasma from a process gas containing, at least, fluorocarbon introduced into said process chamber, wherein; oxygen is added into the process gas. Since Babu uses the same plasma treatment method in treating SiO₂ with the same process gas as those of the claimed invention, then using Babu plasma method and process gas in treating SiO₂

in the same manner as that of the claimed invention would inherently result in the quantity of oxygen added into the process gas is increased/decreased in relative measure, **in claim 7**; and

the quantity of oxygen added into the process gas is increased/decreased cyclicly, **in claim 8**; and

the quantity of oxygen added into the process gas is increased/decreased after the plasma has stabilized, **in claim 12**.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claim 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Babu (US '104) in view of Koshiishi et al. (US 5,919,332).

Babu teaches, "The plasma etching process of the present invention is conveniently conducted in a parallel plate reactor of the type conventionally used for plasma etching of semi-conductor materials" (column 3, lines 17-20), "... and SiO₂ may all serve as the substrate" (column 3, lines 6-12). "In practicing one embodiment of the plasma etching process of the present invention, the specimen of the substrate material to be etched is mounted on one of the grounded electrodes of the reactor or in between a pair electrodes. The gas containing the organohalide (same as applicant's fluorocarbon, process-gas) compound with or without oxygen is introduced into the reactor and a high frequency (RF) power is applied between the power and ground electrodes to produce a plasma between them" (column 3, lines 26-34). "In practicing another embodiment of this invention, the reactor is operated under non-steady state conditions. Such operation may be accomplished by repeatedly varying the etchant gas competition between organohalide-containing (same as applicant's fluorocarbon, process-gas) and non-organohalide-containing (same as applicant's oxygen) by alternating pulses of the etchant gas compositions" (column 3, lines 50-56). The aforementioned reads on,

A plasma processing method for implementing a plasma process on a silicon oxide film layer formed at a workpiece placed on a second electrode by introducing a process gas containing, at least, fluorocarbon into a process chamber, wherein; oxygen is added intermittently added into the process gas, **in claim 17**; and

wherein oxygen is cyclically added to the process gas, **in claim 18**.

Babu differs in failing to teach the frequency of the high-frequency power applied to said second electrode is lower than the frequency of the high-frequency power applied to said first electrode, **in claim 17**.

Koshiishi teaches, "Thereafter, the upper electrode 21 is supplied with a high frequency power of frequency 27.12 MHz from the high frequency power source 47, and then, a plasma is generated between the upper electrode 21 and the susceptor 6. With a slight delay (about 1 second or less) from the generation of a plasma, the susceptor 6 is supplied with a high frequency power of frequency 800 kHz from the high frequency power source 44. Thus, by supplying a high frequency power for the susceptor 6 at a delayed timing, a wafer W is prevented from being damaged by an excessive voltage (column 17, lines 43-52).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Babu by using Koshiishi's method of applying power to an electrode for the purpose of preventing the wafer from being damaged by excessive voltage (column 17, lines 51-52).

Allowable Subject Matter

7. Claims 3-5, 9-11, and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. Claims 13-16 and 20-22 are allowed. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record fails to respectively teach the quantity of oxygen added into the process gas that contains fluorocarbon is increased in proportion to an increase in the aspect ratio of a contact hole formed at said silicon oxide film layer and said plasma process is implemented while increasing/decreasing the quantity of oxygen added into the process gas.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703-305-2667. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Lynette T. Umez-Eronini
ltue

October 20, 2003